

Species diversity of birds in mangroves of Kundapura, Udupi District, Karnataka, Southwest Coast of India

Vijaya Kumar K.M • Vijaya Kumara

Received: 2013-4-20;

Accepted: 2013-8-12

© Northeast Forestry University and Springer-Verlag Berlin Heidelberg 2014

Abstract: We quantified species diversity of birds in mangroves at Kundapura from April-2010 to March-2013. We recorded 79 species of 36 families and 14 orders. Of these 71% are resident species, 22% are residential migrants and 8% are migratory. One endangered species, three near threatened species, and a few occasional visitors were recorded. Species diversity and abundance of birds were greater during from October through May as there was availability of food, increased vegetation and the arrival of migratory birds. Minimum diversity was recorded from June through September owing to heavy rains, increased flow of water, limited availability of food and return of migratory birds.

Keywords: Species, mangroves, birds, threatened; migratory

Introduction

Mangroves are trees and shrubs that grow in saline coastal habitats in the tropics and subtropics. They fall into two groups according to their habitats in nature: true mangroves and mangrove associates. True mangroves refer to species that specifically

grow in intertidal zones, while mangrove associates are capable of occurring in either littoral or terrestrial habitats. Nagelkerken et al. (2000) defined a mangrove as, “a tree, shrub, palm or ground fern, generally exceeding one and half metre in height, and which normally grows above mean sea level in the intertidal zone of marine coastal environments, or estuarine margins”. Mangrove forests are among the world’s most productive ecosystems. They enrich coastal waters, yield commercial forest products, protect coastlines, and support coastal fisheries (Kathiresan et al. 2001). The biodiversity of mangroves has also been of increasingly greater interest, firstly because of the Convention on Biological Diversity, and secondly, because the mangrove ecosystems are among the most threatened by the global climate changes, particularly the sea level rise.

Birds are a prominent part of most mangrove forests and they are often present in large numbers. Mangrove habitats offer rich feeding grounds for many of the large and more spectacular species as well as a multitude of small birds. Both aquatic as well as tree dwelling birds are commonly found in mangroves and associated areas. Mangroves constitute a unique habitat for birds. They provide nesting and breeding places for birds. Little information is available on the birds associated with mangroves in India. Samant (1985) listed 121 species of birds occurring in mangroves around Rathnagiri, Maharashtra, and 24 migratory species were listed from the Sunderbans. Several species of birds occurring in mangroves along the Kerala coast were reported by Kurup (1996).

Little cormorant and black crowned night heron were the two most common species found in the Mangalavanam mangroves, Cochin, Kerala (Grimmett et al. 1998; Bikram 1995). 160 species of birds of 50 families were recorded in Muthupet mangrove by Deiva Oswin (1999). They recorded 134 species of birds of 14 orders and 37 families. One of the largest nesting colonies of water birds in India is located in mangrove forests of Bhitarkanika National Park, Orissa (Pandav 2004). Sumit Sen (2006) surveyed Sundarbans mangrove forests and recorded eight of the twelve species of kingfishers found in India. A total of 263 bird species of 63 families were recorded in Bhittarkanika mangroves by Gopi and Pandav (2007). Fifty-six species of birds of 29

Project funding: This study was supported by the "Strategic Priority Research Program" of the Chinese Academy of Sciences (XDA05050205) and "International Science & Technology Cooperation Program of China (2012DFB30030)" and "Youth Innovation Fund of Hunan Academy of forestry" and the CFERN&GENE Award Funds for Ecological Papers.

The online version is available at <http://www.springerlink.com>

Vijaya Kumar K.M (✉)

Department of Zoology, Bhandarkars' Arts and Science College, Kundapura-576 201, India.

Email: vijay.kshalli@gmail.com; vijayakumarm69@gmail.com

Vijaya Kumara

Department of Post Graduate Studies and Research in Wildlife and Management, Bioscience Block, Kuvempu University, Shankaraghatta-577451, India.

Corresponding editor: Zhu Hong

families were recorded in Uran mangroves by Pawar (2011). There is no report on the avifauna communities of Kundapura mangroves. The above studies highlight the need for the inventory of birds at other mangrove habitats.

Materials and methods

Study area

Our study area was at Kundapura, 445 km west of Bangalore and 36 kilometers north of Udupi, at 13°37'24" N latitude and 74°41'30" E longitude and maximum elevation of 18 m asl. Four study sites (Table 1) along the coastline of Kundapura were separated by approximately 5 km. The study sites are islands along the backwaters of the Haladi River. This area (Herikudru) is a small island. Here, the trees are planted by the local people to protect their agricultural fields from erosion. Uppinakudru is being completely under the tidal influx. There are several mangrove patches measuring about 1 to 4 acres. Jalady is known as Jaladi or Rajadi Bridge, and is completely under tidal influence. In view of this situation there is a good formation of Mangroves. The trees here are 70 years old. Here, the trees are planted by the local people to protect their agricultural fields from erosion. Totally about 20–25 acres of land is reserved for mangrove regeneration. Good formations of mangroves are recorded. Hemmady is a riverine bank along the back waters of the river Haladi and the area is completely under the tidal influence. Good formations of mangroves are recorded.

Table 1. Study sites

Study sites	Latitude	Longitude	Elevation
Site-1 Herikudru	13°38'28"N	74°42'01"E	28'
Site-2 Uppinakudru	13°39'21"N	74°41'59"E	25'
Site-3 Jaladi	13°39'41"N	74°42'16"E	16'
Site-4 Hemmadi	13°40'46"N	74°41'20"E	32'

Bird watching

Our list of birds was compiled from field work conducted from April-2010 to March-2013. Weekly visits to the sites were made for three years with a maximum of 4 visits per month. Binoculars were used for bird watching; photographs were taken with a Nikon SLR Digital Camera. The birds can be recorded by line transect method (Burnham et al. 1980). Birds were identified by reference to field guides (Grewal 1995; Grimmett et al. 2006; Ali 2002).

Surveys were conducted every weekend in the early morning from 5.00–7.30 and every evening from 5.00–7.30. The relative abundance of birds was estimated and monthly fluctuations were recorded. We quantified bird diversity and abundance in the study area. Birds were classified on the basis of “The Book of Indian birds” (Ali 2002; Bikram 1995). Shannon Diversity Index is Species diversity was calculated using the Shannon Diversity Index.

$$H = - \sum_{i=1}^S (P_i \times \ln P_i) \quad (1)$$

where, H is the Shannon diversity index; P_i is fraction of the entire population made up of species i ; S is numbers of species encountered. \sum is sum from species 1 to species S .

Results and discussion

The dense mangroves vegetation is present at Kundapura, particularly in the confluence zone of the three rivers namely Chakra, Kollur and Haladi, just before they open into the Arabian Sea. In this estuarine complex an area of about 30,700 m² is occupied by mangroves.

True mangroves

The results after the intensive survey made from the selected sites, showed the following nine true mangrove floral species belonging to six families (Table 2). The species *Rhizophora mucronata* and *Avicennia officinalis* are the dominant mangroves found in all the sites. The next dominating species are *Kandelia candel*, *Bruguiera gymnorrhiza*, *Sonneratia alba*, *Aegicerus corniculatum*, *Excocaria agallocha* and *Acanthus ilicifolius* are found distributed in all the selected sites, *Rhizophora apiculata* is recorded in site-1 and site-3.

Mangrove associates

About ten mangroves associated floral species belonging to nine families were identified along the inundated and the adjacent regions at the study area (Table 3). The species such as *Derris trifoliata*, *Acrostichum aureum*, *Chlerodendron inerme*, *Ipomoea pes-carpae*, *Sesuvium portulacastrum*, *Aeluropus lagopoides*, *Fimbristylis ferruginea* were found distributed at all the sites, whereas *Dalbergia spinosa*, are limited in their distribution to site-3, *Pandanus odoratissimus* is seen in site-2, *Caesalpinia crista* found distributed in site-2, 3 and 4.

A total of 79 species of birds representing 14 orders and 36 families were recorded from the mangroves of Kundapura (Appendix 1). Of the recorded species, 37% belonged to order Ciconiiformes, Passeriformes-32%, Coraciiformes-11%, Piciformes-4%, Cuculiformes, Strigiformes and Columbiformes each with 3%, and Galliformes, Upupiformes, Psittaciformes, Apodiformes, Gruiformes, Anseriformes, and Bucerotiformes, each with 1%. Ciconiiform species were dominant in Kundapura mangroves and were represented by 8 families, followed by Passeriformes with 10 families, Coraciiformes with 5 families, Strigiformes and Cuculiformes each with 2 families, and Piciformes, Columbiformes, Galliformes, Upupiformes, Psittaciformes, Apodiformes, Gruiformes, Anseriformes, and Bucerotiformes each with one family.

Birds sighted during the study period were categorized as residents, resident migrants and migrants. The resident category includes birds that breed in the study area and migrate locally.

Resident migrants were residents and migratory throughout the Indian sub-continent. Migrants were sighted occasionally, only during the migration period. The species diversity of birds in

Kundapura mangroves comprises (Fig. 1) 56 residents (71%), 17 resident migrants (22%), and 6 migrants (8%).

Table 2. Diversity of true mangroves

Sl. No	Scientific name	Family name	Life form	Site-1	Site-2	Site-3	Site-4
1	<i>Avicennia officinalis</i>	Avicenniaceae	T	+	+	+	+
2	<i>Rhizophora mucronata</i>	Rhizophoraceae	T	+	+	+	+
3	<i>Rhizophora apiculata</i>	Rhizophoraceae	T	+	-	+	-
4	<i>Bruguiera gymnorrhiza</i>	Rhizophoraceae	T	+	+	+	+
5	<i>Kandelia candel</i>	Rhizophoraceae	T	+	+	+	+
6	<i>Sonneratia alba</i>	Sonneratiaceae	T	+	+	+	+
7	<i>Aegicerus corniculatum</i>	Myrsinaceae	S	+	+	+	+
8	<i>Acanthus ilicifolius</i>	Acanthaceae	S	+	+	+	+
9	<i>Excoecaria agallocha</i>	Euphorbiaceae	T	+	+	+	+

Table 3. Diversity of mangrove associates

Sl.No	Botanical Name	Family Name	Life forms	Site-1	Site-2	Site-3	Site-4
1	<i>Chlerodendron inerme</i>	Verbenaceae	S	+	+	+	+
2	<i>Derris trifoliata</i>	Fabaceae	V	+	+	+	+
3	<i>Dalbergia spinosa</i>	Fabaceae	S	-	-	+	-
4	<i>Acrostichum aureum</i>	Pteridaceae	S	+	+	+	+
5	<i>Ipomoea pes-carpae</i>	Convolvulaceae	V	+	+	+	+
6	<i>Pandanus odoratissimus</i>	Pandanaceae	T	-	+	-	-
7	<i>Sesuvium portulacastrum</i>	Alzoaceae	v	+	+	+	+
8	<i>Caesalpinia crista</i>	Caesalpinaceae	S	-	+	+	+
9	<i>Aeluropus lagopoides</i>	Poaceae	G	+	+	+	+
10	<i>Fimbristylis ferruginea</i>	Cyperaceae	Se	+	+	+	+

Notes: T is Tree, S is Shrub, V is Vine, G is Grass, Se is Sedge, + is Present, - is absent.

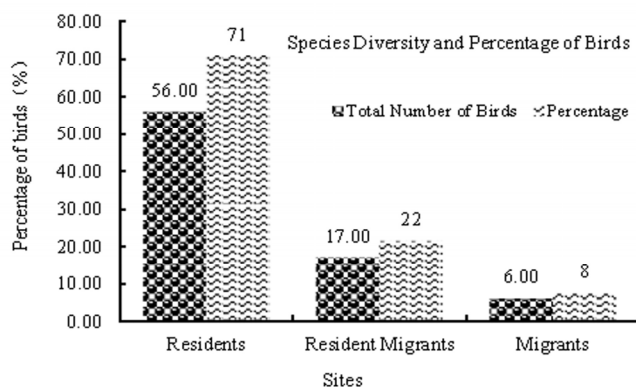


Fig. 1. Species diversity and percentage of total counts by residence status

Greater Adjutant (*Leptoptilos dubius*) is an endangered species (IUCN 2013) sighted once in January 2013. Black-headed Ibis (*Threskiornis melanocephalus*) is a near threatened species (IUCN 2013) recorded from October to May. Darter (*Anhinga melanogaster*) is a near threatened species (IUCN 2013) that was recorded occasionally. Great hornbill (*Buceros bicornis*) is a near threatened species (IUCN 2013) that was recorded occasionally.

Woolly-necked Stork (*Ciconia episcopus*) was sighted only once during the study period in December 2012. Black-capped Kingfisher (*Halcyon pileata*) was sighted only once in the study period (6 January 2013).

Indian Peafowl (*Pavo cristatus*) was observed throughout the year. Flocks of one cock with 4 or 5 hens were typically observed. Kingfishers recorded in the study area included Common Kingfisher (*Alcedo atthis*), White-throated Kingfisher (*Halcyon smyrnensis*), Pied Kingfisher (*Ceryle rudis*), Stork-billed Kingfisher (*Halcyon capensis*) and Black-capped Kingfisher (*Halcyon pileata*). Green Bee-eater (*Merops orientalis*) is a resident species, recorded from October to June. Blue-tailed Bee-eater (*Merops philippinus*) and Chestnut-headed Bee-eater (*Merops leschenaulti*) were winter visitors recorded from October to January.

Asian Koel (*Eudynamis scolopacea*), Greater Coucal (*Centropus sinensis*), Rose-ringed Parakeet (*Psittacula krameri*), Crested Treeswifts (*Hemiprocne coronata*), Spotted Dove (*Streptopelia chinensis*), Rock Pigeon (*Columba livia*), White-breasted Waterhen (*Amaurornis phoenicurus*) are resident birds and were recorded throughout the year.

Black-rumped Flameback (*Dinopium benghalense*), Brown-headed Barbet (*Megalaima zeylanica*), White-cheeked Barbet (*Megalaima viridis*), Indian Roller (*Coracias*

benghalensis), Barn Owl (*Tyto alba*), Spotted Owlet (*Athene brama*), Jungle Babbler (*Turdoides striatus*), Crested Lark (*Galerida cristata*), Oriental Skylark (*Alauda gulgula*), Indian Bushlark (*Mirafra erythroptera*), Black-headed Munia (*Lonchura malacca*), Baya Weaver (*Ploceus philippinus*), Paddyfield Pipit (*Anthus rufulus*), House Sparrow (*Passer domesticus*), Common Tailorbird (*Orthotomus sutorius*), Zitting Cisticola (*Cisticola juncidis*), Rufous Treepie (*Dendrocitta vagabunda*), Pied Bush Chat (*Saxicola caprata*), Red-whiskered Bulbul (*Pycnonotus jocosus*), Chestnut-tailed Starling (*Sturnus malabaricus*), White-browed Wagtail (*Motacilla maderaspatensis*) are resident birds and were recorded throughout the study period. Orange-headed Thrush (*Zoothera citrina cyanotus*) is a resident bird sighted only once in the study site in February 2013. Common Hoopoe (*Upupa epops*) is a resident migrant and was recorded occasionally.

Hérons and Egrets were found in large numbers. Black-headed Ibis (*Threskiornis melanocephalus*) was recorded from October to May. Black Ibis (*Pseudibis papillosa*) was recorded occasionally.

Hérons, Egrets, and Ibises are the most conspicuous groups of birds that are found in mangroves (Deiva Oswin 1999). Mangroves function as feeding grounds for wading birds, since two thirds of these species feed almost exclusively on fishes (Odum et al. 1982). Black-headed Ibis feeds predominantly on crabs from mangroves (Kushlan and Kushlan 1975).

Little Cormorant (*Phalacrocorax niger*) was recorded during all seasons. It was recorded in large numbers. Birds of this group are permanent residents and usually breeds in mangrove swamp (Deiva Oswin 1999).

Red-wattled Lapwing (*Vanellus indicus*) and Common Sandpiper (*Actitis hypoleucos*) occupied the study area throughout the year. Red-wattled Lapwing typically occupies open country, ploughed fields, grazing land and margins of dry beds of tanks and puddles. Curlew Sandpiper (*Calidris ferruginea*), Kentish Plover (*Charadrius alexandrinus*) and Little Ringed Plover (*Charadrius dubius*) were common winter visitors seen in large flocks on mudflats, creeks, saltpans, and marshes. Common Redshank (*Tringa totanus*) were widespread winter visitors seen in large flocks on mudflats, creeks, saltpans, and marshes. Marsh Sandpiper (*Tringa stagnatilis*), Ruddy Turnstone (*Arenaria interpres*), Sanderling (*Calidris alba*), Long-toed Stint (*Calidris subminuta*) and Common Greenshank (*Tringa nebularia*) were migratory birds recorded from October to January. Winter was the most crucial time for the survival of shore birds (Baker and Baker 1973) but coincidentally winter is the time when shore birds use mangrove areas (Odum et al. 1982). Brahminy Kite (*Haliastur indus*) and Black Kite (*Milvus migrans*) were recorded throughout the year.

Asian Openbill (*Anastomus oscitans*) is a resident and local migrant, and was recorded from October to May. Black Drongo (*Dicrurus macrocercus*) was recorded in the study area. Greater Racket-tailed Drongo (*Dicrurus paradiseus*) was occasionally sighted in the study area. Common Myna (*Acridotheres tristis*) is a widespread resident species and was recorded in large numbers throughout the study period.

House Crow (*Corvus splendens*) was found in large numbers. It roosted communally in trees or groves where large numbers collect every night. Asian Paradise-flycatcher (*Terpsiphone paradisi*) is a widespread resident migrant species seen in forest and well wooded areas. Eurasian Golden Oriole (*Oriolus oriolus*) and Black-hooded oriole (*Oriolus xanthornus*) were occasionally recorded. Oriental Magpie Robin (*Copsychus saularis*) was sighted singly or in pairs around mangroves.

Purple-rumped Sunbird (*Nectarinia zeylonica*) was recorded throughout the study period in pairs in bushy mangroves. Lesser Whistling-duck (*Dendrocygna javanica*) is a resident waterfowl species. It was recorded in large numbers in site-2 and site-4. Water birds, being generally at or near the top of most wetland food chains are highly susceptible to habitat disturbances and are therefore good indicators of the general condition of wetland habitats (Kushlan 1992). Great Hornbill (*Buceros bicornis*) is a resident and locally migratory species that was recorded occasionally.

Species diversity and abundance of birds peaked during October-May with the arrival of migratory birds. Minimum diversity was recorded during June-September owing to the departure of migratory birds. Species diversity was highest during pre monsoon and post monsoon and lower during monsoon at all the study sites (Table 4). Similar observations were also made by Bhat et al. 2009.

Table 4. Total bird count and species diversity index

Sites	Total bird count	Species diversity index(H)	Monsoon		Post monsoon		Pre monsoon	
			TBC	H	TBC	H	TBC	H
1	5570	3.22	1397	2.90	2110	4.41	2063	4.09
2	4680	2.53	1152	2.27	1707	3.42	1821	3.28
3	21066	4.97	5122	3.83	7620	5.71	8324	4.95
4	17269	4.64	4094	3.69	6354	5.60	6821	4.98

Notes: TBC is total bird count, H is Species diversity index. Monsoon: Rainy season (June, July, August and September); Post monsoon: After monsoon season (October, November, December and January); Pre monsoon: Summer season (February, March, April and May).

Total numbers of birds inhabiting site-1, site-2, site-3 and site-4 are listed in Table 4. Site-1 was occupied by 11% of birds, site-2 was occupied by 10% of birds, site-3 was occupied by 43% of birds and site-4 was occupied by 36% of birds. Most birds occupied site-3 and site-4. Good formations of mangroves are recorded in site-3 and site-4. Hence most of the birds selected these sites as feeding, breeding, and roosting place; hence more number of birds was recorded in these sites. Only patches of mangrove vegetation are recorded in site-1 and site-2. Hence less number of birds was recorded in these sites.

Conclusions

Kundapura mangroves support a rich diversity of birds. Extraction of shells, conversion of mangrove habitat into aquaculture ponds, harvesting of mangroves for fire wood, building materials

and cattle feed is major threats to the mangroves. Along the coastal belt shrimp farming has been expanding. The shrimp farming results in conversion of flat agricultural and coastal lands to shrimp ponds. This conversion of coastal wetlands will result in loss of foraging grounds and wintering grounds for a variety of bird species. Hence, it is required to restore the original ecological features of mangroves by the Government, NGOs and general public to conserve these coastal ecosystems. Since no earlier reports are available, data presented here can be used as a baseline on the status of birds in these mangroves. This information can form a useful tool for further studies and monitoring of these coastal ecosystems.

Acknowledgement

The author thanks the University Grants Commission, New Delhi for financial support, and the authorities of Bhandarkars' Arts and Science College, Kundapura for the facilities provided.

References

- Baker MC, Baker AEM. 1973. Niche relationships among six species of shorebirds on their wintering and breeding ranges. *Ecol Monogr*, **43**(2): 193–212.
- Bhat PI, Cristopher SS, Hosetti BB. 2009. Avifaunal diversity of Anekere Wetland, Udupi district, Karnataka, India. *Journal of Environmental Biology*, **30**(6): 1059–1062.
- Bikram Grewal. 1995. *Birds of the Indian sub continent*. Hong Kong: Guide Book Company limited, pp. 6–962.
- Burnham KP, Anderson DR, Laake JL. 1980. Estimation of density from line transect sampling of biological populations. *Wildlife Monograph*, **72**: 1–202.
- Deiva Oswin S. 1999. Avifaunal Diversity in Muthupet mangrove forest. *Zoos' Print Journal*, **14**(6): 47–53.
- Gopi GV, Bivash Pandav. 2007. Avifauna of Bhitarkanika mangroves. *Zoos' Print Journal*, **22**(10): 2839–2847.
- Grimmett R, Inskipp C, Inskipp T. 1998. *Birds of the Indian subcontinent*. New Delhi: Oxford University Press, p. 888.
- Grimmett R, Inskipp C, Inskipp T. 2006. *Pocket guide to the Birds of Indian subcontinent*. Oxford: Oxford University Press, pp. 6–371.
- IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. Available at: www.iucnredlist.org.
- Kathiresan K and Bingham BL. 2001. *Biology of mangroves and mangroves ecosystems*. New York: Academic Press, pp. 81–251.
- Karup DN. 1996. Ecology of the Birds of Bharathapuzha Estuary and Survey of the Coastal Wetlands of Kerala. Trivandrum: Final report submitted to Kerala Forest Department, p. 59.
- Kushlan JA, Kushlan MS. 1975. Food of the White ibis in Southern Florida. *FlaSci*, **42**:123–129.
- Kushlan JA. 1992. Population biology and conservation of colonial water birds. *Colonial water birds*, **15**:1–7.
- Nagelkerken I, van der Velde G, Gorissen MW, Meijer GJ, Van't Hof T, den Hartog C. 2000. Importance of mangroves, seagrass beds and the shallow coral reef as a nursery for important coral reef fishes, using a Visual census technique. *Estuarine, Coastal and Shelf Science*, **51**(1): 31–44.
- Odum WE, CC McIvor, Smith TJ. 1982. The Ecology of the Mangroves of South Florida: A Community Profile. Available at: <http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA323074>.
- Pandav B. 2004. Colonial nesting of water birds in Bhitarkanika mangroves, Orissa, *Forktail*, **12**: 9–20.
- Pawar PR. 2011. Species diversity of birds in mangroves of Uran, Navi Mumbai, *Journal of Experimental Sciences*, **2**(10): 73–77.
- Salim Ali. 2002. *The book of Indian birds (13th revised edition)*. New Delhi: Oxford University Press, p. 326.
- Samant JS. 1985. Avifauna of the Mangroves around Rathnagiri, Maharashtra. In: L. J. Bhosale (ed.), *Proceedings of the National Symposium on Biology, Utilization and Conservation of Mangroves*. Kolhapure, Maharashtra, India: Shivaji University Press, pp.456 – 466.
- Sumit Sen. 2006. *Birds of India: Sunderbans Trip Report-Birds of Kolkata*. January-2006. Available at: <http://www.kolkatabirds.com/sundertrip6.htm>.

Appendix 1. List of birds sighted in the study area

Sl.No	Order	Family	Common name	Scientific name	Status
1	Galliformes;	Phasianidae	Indian Peafowl	<i>Pavo cristatus</i>	Resident
2	Piciformes;	Picidae	Black-rumped Flameback	<i>Dinopium benghalense</i>	Resident
3			Brown-headed Barbet	<i>Megalaima zeylanica</i>	Resident
4			White-cheeked Barbet	<i>Megalaima viridis</i>	Resident
5	Upupiformes;	Upupidae	Common Hoopoe	<i>Upupa epops</i>	Resident Migrant
6	Coraciiformes;	Coraciidae	Indian Roller	<i>Coracias benghalensis</i>	Resident
7		Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>	Resident Migrant
8		Dacelonidae	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	Resident
9			Stork-billed Kingfisher	<i>Halcyon capensis</i>	Resident
10			Black-capped Kingfisher	<i>Halcyon pileata</i>	Resident
11		Cerylidae	Pied Kingfisher	<i>Ceryle rudis</i>	Resident
12		Meropidae	Green Bee-eaters	<i>Merops orientalis</i>	Resident
13			Blue-tailed Bee-eaters	<i>Merops philippinus</i>	Resident Migrant
14			Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	Resident
15	uculiformes;	Cuculidae;	Asian Koel	<i>Eudynamis scolopacea</i>	Resident
16		Centropodidae	Greater Coucal	<i>Centropus sinensis</i>	Resident
17	Psittaciformes;	Psittacidae	Rose-ringed Parakeet	<i>Psittacula krameri</i>	Resident
18	Apodiformes;	Hemiprocidae	Crested Treeswifts	<i>Hemiprocne coronata</i>	Resident
19	Strigiformes;	Tytonidae	Barn Owl	<i>Tyto alba</i>	Resident
20		Strigidae	Spotted Owlet	<i>Athene brama</i>	Resident

Continued Appendix 1.

Sl.No	Order	Family	Common name	Scientific name	Status
21	Columbiformes;	Columbidae	Blue Rock Pigeon	<i>Columba livia</i>	Resident
22			Spotted Dove	<i>Streptopelia chinensis</i>	Resident
23	Gruiformes;	Rallidae	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Resident
24	Ciconiformes	Ardeidae	Indian Pond Heron	<i>Ardeola grayii</i>	Resident
25			Little Heron	<i>Butorides striatus</i>	Resident
26			Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Resident
27			Grey Heron	<i>Ardea cinerea</i>	Resident Migrant
28			Purple Heron	<i>Ardea purpurea</i>	Resident Migrant
29			Great Egret	<i>Casmerodius albus</i>	Resident Migrant
30			Cattle Egret	<i>Bubulcus ibis</i>	Resident Migrant
31			Little Egret	<i>Egretta garzetta</i>	Resident
32			Intermediate Egrets	<i>Mesophoyx intermedia</i>	Resident Migrant
33		Threskiornithidae	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Resident
34			Black Ibis	<i>Pseudibis papillosa</i>	Resident
35		Phalacrocoracidae	Little Cormorants	<i>Phalacrocorax niger</i>	Resident Migrant
36		Anhingidae	Darters	<i>Anhinga melanogaster</i>	Resident Migrant
37		Charadriidae	Red-wattled Lapwing	<i>Vanellus indicus</i>	Resident
38			Kentish Plover	<i>Charadrius alexandrinus</i>	Resident Migrant
39			Little Ringed Plover	<i>Charadrius dubius</i>	Resident Migrant
40		Scolopaciidae	Common Sandpiper	<i>Actitis hypoleucos</i>	Resident Migrant
41			Marsh Sandpiper	<i>Tringa stagnatilis</i>	Migrant
42			Curlew Sandpiper	<i>Calidris ferruginea</i>	Migrant
43			Common Redshank	<i>Tringa totanus</i>	Resident Migrant
44			Ruddy Turnstone	<i>Arenaria interpres</i>	Migrant
45			Sanderling	<i>Calidris alba</i>	Migrant
46			Long Toed Stint	<i>Calidris subminuta</i>	Migrant
47			Common Greenshank	<i>Tringa nebularia</i>	Migrant
48		Accipitridae	Pariah Kite	<i>Milvus migrans</i>	Resident
49			Brahminy Kite	<i>Haliastur indus</i>	Resident
50		Ciconidae	Asian Openbill	<i>Anastomus oscitans</i>	Resident
51			Greater Adjutant	<i>Leptoptilos dubius</i>	Resident Migrant
52			Woolly-necked Stork	<i>Ciconia episcopus</i>	Resident
53	Passeriformes;	Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i>	Resident
54			Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>	Resident
55		Sturnidae	Common Myna	<i>Acridotheres tristis</i>	Resident
56			Chestnut-tailed Starling	<i>Sturnus malabaricus</i>	Resident
57		Pycnonotidae	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	Resident
58		Silvidae	Jungle Babbler	<i>Turdoides striatus</i>	Resident
59		Corvidae	House Crow	<i>Corvus splendens</i>	Resident
60			Asian Paradise-flycatcher	<i>Terpsiphone paradisi</i>	Resident Migrant
61			Eurasian Golden Oriole	<i>Oriolus oriolus</i>	Resident Migrant
62			Black-hooded Oriole	<i>Oriolus xanthornus</i>	Resident
63			Rufous Treepie	<i>Dendrocitta vagabunda</i>	Resident
64		Muscicapidae	Oriental Magpie Robin	<i>Copsychus saularis</i>	Resident
65			Pied Bush Chats	<i>Saxicola caprata</i>	Resident
66			Orange-headed Thrush	<i>Zoothera citrina cyanotus</i>	Resident
67		Alaudidae	Crested Lark	<i>Galerida cristata</i>	Resident
68			Oriental Skylark	<i>Alauda gulgula</i>	Resident
69			Indian Bush Lark	<i>Mirafra erythroptera</i>	Resident
70		Nectarinidae	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	Resident
71		Passeridae	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	Resident
72			Black-headed Munia	<i>Lonchura malacca</i>	Resident
73			Baya Weaver	<i>Ploceus philippinus</i>	Resident
74			Paddyfield Pipit	<i>Anthus rufulus</i>	Resident
75			House Sparrow	<i>Passer domesticus</i>	Resident
76		Cisticolidae	Common Tailorbird	<i>Orthotomus sutorius</i>	Resident
77			Zitting Cisticola	<i>Cisticola juncidis</i>	Resident
78	Anseriformes;	Anatidae	Lesser Whistling-ducks	<i>Dendrocygna javanica</i>	Resident
79	Bucerotiformes;	Bucerotidae	Great Hornbill	<i>Buceros bicornis</i>	Resident